The Who, Why and How of Spin-offs

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The who, why and how of spinoffs*

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Abstract: Studies have consistently found that entrepreneurs who enter industries in which they have prior experience as employees perform better than others. We nevertheless know relatively little about what accounts for these differences. The presumed explanation has generally been that these entrepreneurs benefit from the knowledge that they gained in their former jobs. But they might also differ from other entrepreneurs on a variety of other dimensions: Preferential access to resources or differing motivations, for example, may account for their decisions to enter known industries instead of new ones. Combining novel data from a representative survey of entrepreneurs in Denmark with a matched employer-employee database of all residents in Denmark, we examined how entrepreneurs with prior industry experience differed from those without and the extent to which these differences could account for the performance premium associated with prior industry experience. We found that those with industry experience came from younger, smaller and more profitable firms, and that they recruited more experienced employees, worked harder and placed less value on having flexible hours. The recruitment of more experienced employees and the greater effort exerted appeared to account for at least some of the performance advantage associated with prior industry experience.

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Scholars from a wide range of perspectives, from organization theory and strategy to economics and finance, have long been interested in the sources of homogeneity and heterogeneity among young firms. Within these literatures, one of the more consistent findings has been the fact that firms founded by entrepreneurs with prior experience in an industry appear advantaged relative to those coming from other industries. Researchers have assigned the organizations established by these experienced entrepreneurs a variety of names – they have been called spinoffs, spinouts, spawn and progeny – but, regardless of the label assigned, these firms have been found to survive longer (Phillips 2002; Agarwal et al. 2004; Dahl and Reichstein 2007; Klepper 2007), to attain larger size (Roberts et al. 2011), to earn larger profits (Dahl and Sorenson 2012) to attract more funding at higher valuations (Chatterji 2009), and to introduce more innovative products (Agarwal et al. 2004).

The assumption in these studies has generally been that these advantages emerge from the transfer of knowledge from "parent" firms, the prior employers of these entrepreneurs, to their progeny. Spinoff entrepreneurs, for example, may have had access to valuable technical knowledge at their prior employers that they then carried with them to their new ventures (Bhide 1994; Anton and Yao 1995; Agarwal et al. 2004). Or, these entrepreneurs might benefit from more general knowledge about effective organizational blueprints and routines for the industry (Phillips 2002). But the evidence in support of this mechanism remains limited. Few studies have had direct information about the potential transfer of knowledge. Those that did, moreover, have found that spinoffs outperform other startups even after controlling for their better access to technical and organizational knowledge (Phillips 2002; Agarwal et al. 2004; Chatterji 2009), suggesting that spinoffs do not benefit *only* from the transfer of knowledge.

One possible explanation for this residual effect is that spinoffs also have preferential

access to other resources: Founders with experience in the industry, for example, have social connections that could help them to identify and recruit able early employees to their ventures (Sorenson and Audia 2000). Investors may also perceive prior industry experience as a positive signal, increasing the ability of the founders of spin-offs to raise capital (MacMillan et al. 1985; Burton et al. 2002; Chatterji 2009). These financial resources, moreover, could have a self-confirming character as they allow the firms receiving them to hire more productive employees, to expand more rapidly and to weather temporary downturns.

Another possible explanation is that spin-off entrepreneurs differ from others in terms of their motivations for becoming an entrepreneur. Research on entrepreneurs in general suggests that many open their own firms for the intrinsic rewards of doing so—being one's own boss, being able to spend more time with family and friends, feeling a sense of accomplishment, etc. (e.g., Benz and Frey 2008; Wasserman 2012). Those who start businesses in industries in which they do not have experience have made an active decision to do something different. Perhaps they did not like their jobs. Perhaps they were not good at them. Regardless of the specific reasons underlying their choices, this process represents a form of self-selection that may mean that spin-off entrepreneurs differ from others in terms of their abilities and motivations.

To date, however, researchers have generally not been able to explore many of these possibilities. Doing so requires not just detailed information about a set of startups and the employment histories of their founders but also insight into the attitudes of these individuals. Though numerous researchers have invested valuable effort into assembling a number of high-quality industry-level datasets on spinouts, these databases generally have had only limited information on each founder and therefore researchers have been severely circumscribed in their ability to delve deeply into the mechanisms underlying the effects that they observe.

Here, we addressed these issues by combining two unusual data sets. The first is a survey of a representative sample of individuals who founded companies in Denmark in 2004 ($N = 1361$), which asked entrepreneurs a variety of questions about their motivations for starting a business and the degree to which they received assistance from their social connections. Statistics Denmark has linked this cross-sectional survey to a second, longitudinal, employer-employee database, which allowed us to establish the employment histories of these founders, to identify their early employees and to assess the performance of their ventures.

We found that spinoff entrepreneurs differed from those entering industries in which they did not have experience on multiple dimensions: They had less managerial experience than non-spinoff entrepreneurs; they came from smaller, younger and more profitable parent firms; they recruited fewer family members and more former colleagues to their startups as employees than non-spinoff entrepreneurs; and they placed less value on flexible hours and on some of the intrinsic rewards related to self-employment.

As in prior single-industry studies, Danish spinoff entrepreneurs, on average, enjoyed a substantial performance advantage over non-spinoff entrepreneurs. However, of the numerous differences identified between the two types of entrepreneurs, only a few correlated with the performance of their ventures: Having a more experienced workforce and being willing to work harder both explained a portion of the performance differences between spinoff and non-spinoff entrepreneurs. Our results nonetheless suggest that multiple factors – including selection and social capital – play a role in the performance advantages accorded to prior industry experience.

The spinoff advantage

Numerous labels – such as spinoffs, spinouts, spawn and progeny – have been used to refer to companies founded by those with prior experience in the industry. For clarity, we use the term "spinoff" to refer to this phenomenon.[1] The exact definitions of who qualifies as a spinoff entrepreneur have also varied across studies. Some have categorized as spinoffs only those who had worked for an existing firm in the industry *immediately* prior to founding their venture (e.g., Phillips 2002; Agarwal et al. 2004). Others have included those with prior experience in the industry at any earlier point in their careers (e.g., Klepper 2007; Chatterji 2009). In some cases, any prior experience within the industry qualified an entrepreneur as being a spinoff (e.g., Phillips 2002; Chatterji 2009); in other cases, this definition required prior managerial experience in the industry (e.g., Agarwal et al. 2004; Klepper 2007). Though our results remain robust to any of these definitions, being a spinoff entrepreneur in the analyses reported here refers to the broadest of these possible definitions: having previously been employed, at some point between 1980 and 2003, in any capacity in another firm in the same four-digit industry as one's startup.[2]

Regardless of the specific definition, a large and growing number of studies have found that spinoffs perform better than other startups. In one of the first studies on this topic, Phillips (2002), for example, found that Silicon Valley law firms formed by a former partner from an existing Silicon Valley law firm enjoyed 44% lower failure rates than those founded by other lawyers. Subsequent studies have found that spinoffs experience lower failure rates than

[1]Note, however, that some prior studies, such as Eriksson and Kuhn (2006), have nevertheless used the term "spinoff" as a label for entrepreneurs who may or may not have any prior industry experience. Eriksson and Kuhn (2006) and Muendler and Rauch (2011), for example, use it to refer to teams of founders who previously worked with each other (in any industry).

[2]Though our data did not allow us to track individuals prior to 1980, less than 20% of the respondents had left-censored employment histories.

other startups in a wide variety of industries, from automobiles (Boschma and Wenting 2007; Klepper 2007) and disk drive manufacturing (Agarwal et al. 2004) to fashion design (Wenting 2008), and that they also appear to outperform non-spinoffs on operational measures of performance (e.g., Agarwal et al. 2004; Chatterji 2009).

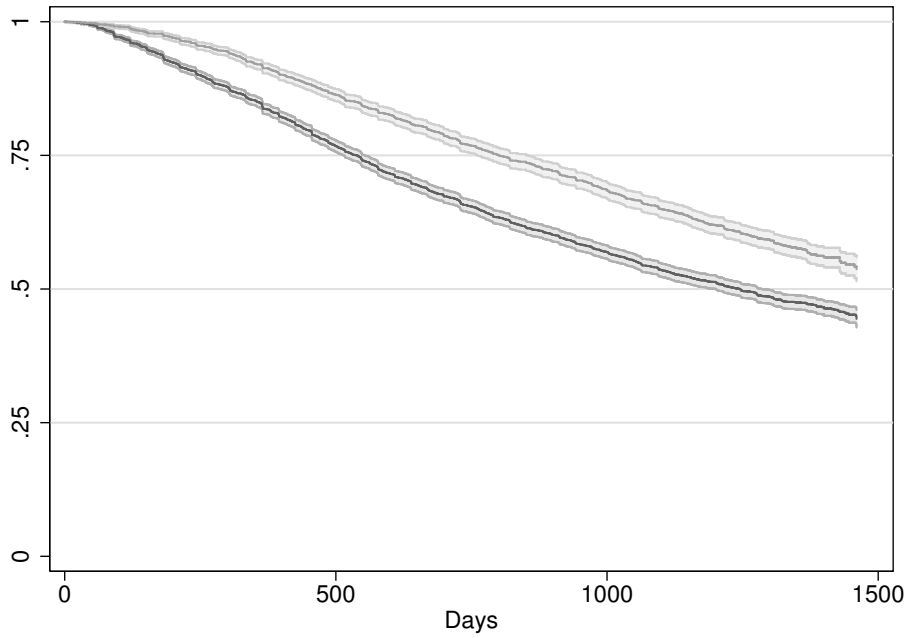

Figure 1: Kaplan-Meier survival plot for spinoffs (light) and non-spinoffs (dark)

Though multi-industry studies have been scarce (for exceptions, see Dahl and Reichstein 2007 and Dencker et al. 2009), this phenomenon appears quite general. Figure 1, for example, provides a Kaplan-Meier plot for the failure rates, over their first four years of operation, for all startups in Denmark founded between 1995 and 2004 ($N = 6799$). The upper line plots the cumulative survival rate for spinoffs (with the shaded region depicting the 90% confidence interval for the estimate) – firms in which the founder had prior experience in the same four-digit industry as his or her startup – while the lower line plots the same curve for non-spinoffs. On average, over the first four years of their lives, spinoffs enjoyed survival

rates roughly ten percentage points higher than non-spinoffs. This gap in survival rates between spinoffs and non-spinoffs in Denmark emerges quickly, within only a few months of founding, and persists without any obvious erosion as firms mature.

Despite the ubiquity of the finding that spinoff entrepreneurs outperform those entering from outside the industry, the factors underlying this effect remain an open question. We see three broad classes of mechanisms that might account for these effects: (i) Spinoff entrepreneurs may bring valuable intellectual capital with them to their ventures (knowledge); (ii) spinoff entrepreneurs may have valuable social capital that assists them in building successful organizations (reputation and relationships); and (iii) selection in who decides to become an entrepreneur in an industry in which they have worked may distinguish spinoff entrepreneurs in terms of their abilities and in terms of the effort they exert (motivations).

Our approach to exploring which of these factors matter most has been first to examine how spinoff entrepreneurs and their companies differ from non-spinoff entrepreneurs using information from the survey and the employer-employee database (described in detail in the Appendix). If spinoff and non-spinoff entrepreneurs do not differ on some dimension, then that factor cannot account for the superior performance of spinoff entrepreneurs (though that factor might have its own independent effects on firm performance). After isolating those dimensions on which the two types of entrepreneurs vary, we then regressed those factors on performance to explore the extent to which they might account for the spinoff advantage.

Knowledge

Perhaps the most commonly presumed explanation for the high performance of spinoff entrepreneurs has been their superior access to private information and/or tacit knowhow relevant to the industry. Researchers have nevertheless differed substantially in the kinds of

knowledge that they have highlighted as important. One group of studies, mostly from organizational scholars, has pointed to the importance of managerial knowhow. Phillips (2002), for example, argued that founders with prior experience in the industry have access to effective organizational blueprints that they can use to establish more effective and reliable routines in their fledgling firms. He further reasoned that these blueprints would be most valuable when they came from larger, older and more successful firms, since the success and stability of these parent firms suggest that they had more effective blueprints at their core. Consistent with these arguments, Phillips (2002) found that law firms founded by former partners of existing law firms had lower exit rates than those started by attorneys without managerial experience. He also found that spinoffs from more successful and larger parents performed better.

Interestingly, others, using a similar logic, have contended that spinoff founders coming from smaller, younger firms should have an advantage. The key difference in the assumptions behind these diverging expectations has to do with the nature of the managerial problem: Whereas those in the first group, such as Phillips (2002), assume that the same blueprints should ensure success for the young and the old, the large and the small, the second group has begun with a belief that running a startup raises its own unique set of managerial challenges. As a result, entrepreneurs should benefit more from employment experience in small firms than in large ones (cf. Lazear 2005). Consistent with this assumption and its implication, Sørensen and Phillips (2011), studying a cross-section of Danish startups, found that organizations started by entrepreneurs who had previously been employed at smaller firms both survived longer and earned more money.

A second group of studies, mostly from economists and students of strategy and focused more on high-technology industries, has emphasized the importance of technical knowledge.

Agarwal et al. (2004), for example, argued that spinoff entrepreneurs benefit from preferential access to the tacit knowledge underlying the products and technologies of their former employers. Analyzing data from the hard disk drive industry, they found that spinoffs produced drives closer to the technological frontier – with higher areal densities and more frequently using the most recent form factors – than non-spinoffs. Even among spinoffs, those whose founders had experience in parent firms with cutting-edge technology entered with more advanced products themselves. Subsequent studies have similarly found strong associations between the technological positions of parents and their progeny in lasers (Klepper and Sleeper 2005), medical devices (Chatterji 2009) and electronics (Yang et al. 2010).

To assess the extent to which spinoff entrepreneurs might benefit from better access to knowledge, we began by comparing their answers to those of non-spinoff entrepreneurs on three relevant questions from the survey.[3] Entrepreneurs indicated the extent to which they considered industry experience, managerial experience and "being an expert" as important to the success of their businesses, choosing either "very important," "important," or "not important" as a response. The upper panel of Table 1 compares the mean responses provided by spinoff entrepreneurs versus non-spinoff entrepreneurs and the Mann-Whitney p-value for the probability that the difference between these means reflects a true difference in the underlying population means.[4]

The fourth column reports the coefficient for an ordered logit regression with the question responses as a dependent variable and the number of years of prior experience in the same four-digit industry (i.e. 0 for non-spinoffs) as the only regressor. Note that the mean differences and the ordered logit coefficient do not convey the same information. Whereas

[3]Please note that the original survey had been implemented in Danish. The questions and answers reported in the paper represent our own translations into English.

[4]The Mann-Whitney test does not require an assumption of normality. It therefore offers a more appropriate test of the difference in means between two ordinal measures than a t-test.

the mean differences depend more on the distinction between spinoff and non-spinoff entrepreneurs, the ordered logit coefficients also depend on the extent to which those with more experience in the same industry differ from those with less. The final column reports the number of valid cases for each question or measure.

Table 1: Bivariate associations for measures of knowledge

	Mean (Spinoff)	Mean (Other)	Mann-Whitney p-value	Ordered logit	N (of 1,361)
How important do you find industry experience to the success of your business?	2.57	2.39	0.000**	0.065 (0.014)**	1,209
How important do you find managerial experience to the success of your business?	1.99	1.99	0.984	-0.010 (0.012)	1,176
How important do you find being an expert or specialist a key to the success of your business?	1.96	1.81	0.001**	0.050 (0.012)	1,178

	Mean (Spinoff)	Mean (Other)	t-test p-value	Poisson	N (of 1,361)
Labor market experience (years)	14.7	15.1	0.481	0.047 (0.007)**	1,361
Industry experience, 4-digit (years)	6.47	0.00			1,361
Related industry experience (years)	2.48	1.98	0.036*	0.064 (0.019)**	1,361
Top management team experience (years)	0.46	0.73	0.037*	-0.076 (0.038)*	1,361
Parent firm age	15.1	20.3	0.000**	-0.122 (0.008)**	1,158
Parent firm size (5-year average number of employees)	718	1934	0.000**	-0.719 (0.001)**	1,162
Parent firm returns over assets[1] (5-year average)	0.99	0.25	0.000**	0.005 (0.002)*	1,162

Both spinoff and non-spinoff entrepreneurs considered industry experience important. In both groups, "very important" represents the modal response. Spin-off entrepreneurs nevertheless felt more strongly about the value of industry experience and expertise. By contrast, though both groups also viewed managerial experience as important, they did not differ noticeably in their opinions. These perceptions, however, may represent an *ex post* rationalization of the choices that entrepreneurs had already made.

The lower panel of the table then compares spinoff and non-spinoff entrepreneurs on

several objective measures of their employment experience.[5] Spinoff entrepreneurs did not differ from other entrepreneurs in terms of their overall level of experience ($p = .481$); *labor market experience* counts the number of years that the individual had been employed at any job prior to founding a firm. They did, however, differ in terms of the industries in which they had experience. Of course, by definition, spinoff entrepreneurs had more industry experience than non-spinoff entrepreneurs: *Industry experience* counts the number of years in which the entrepreneur had previously worked for a firm classified in the same four-digit industry as his or her startup; on average, spinoff entrepreneurs had roughly 6.5 years of experience in the industry before starting their ventures. But not only did spinoff entrepreneurs have more industry experience, they also had more experience in related industries – *related industry experience* counts the number of years that entrepreneurs had been employed in firms in the same two-digit (but different four-digit) industry as their current ventures – an average of 2.5 years (versus 2 years for non-spinoff entrepreneurs).

Interestingly, spinoff entrepreneurs had *less* managerial experience than non-spinoff entrepreneurs. *Top management team* experience tallies the number of years that entrepreneurs had been employed in the senior-most ranks of employees at their prior employers. Whereas spinoff entrepreneurs had .46 years in the managerial ranks, on average, non-spinoff entrepreneurs had nearly 50% more (.73 years). That's somewhat surprising given the fact that numerous accounts have highlighted prior managerial experience as one of the factors favoring spinoff entrepreneurs (e.g., Phillips 2002; Dencker et al. 2009).

The final three variables compare the characteristics of the previous employers of spinoff and non-spinoff entrepreneurs. Spinoff entrepreneurs tended to come from younger firms

[5]Because the measures in the lower half of the table represent continuous counts, we used t-tests to compare the means and we regressed the (logged) number of years of industry experience (plus one) on these measures using Poisson regression.

(an average of 15 years old versus more than 20 years for non-spinoffs), smaller firms (718 employees, on average, versus nearly two thousand employees) and more profitable firms (in terms of return on assets).[6] Those facts seem somewhat more consistent with the idea that startups pose their own managerial challenges than with the idea that proven organizational blueprints work best for all firms at all stages of maturity.

Reputation and relationships

Though spinoff entrepreneurs undoubtedly do accrue industry-specific human capital from their prior experience in the industry, they also acquire industry-specific social capital, in the form of a reputation and relationships. Several factors suggest that this social capital might also prove valuable, in particular in assembling the necessary resources for a new venture.

Investors, employees, buyers and suppliers all face a great deal of fundamental uncertainty when trying to determine whether to invest in or to do business with a fledgling firm. Is the idea good? Does the entrepreneur have the ability to run a firm? Will customers buy in? Social capital often allows entrepreneurs to overcome this uncertainty. Would-be investors or early employees, for example, may view prior employment as a form of endorsement. Some firms have a reputation for attracting and developing high-quality employees. Having been an employee at one of them therefore suggests a certain level of competence and promise. Burton et al. (2002), for example, found that entrepreneurs from firms that had a reputation for producing spinoffs had a higher probability of receiving financing from venture capitalists (see also Higgins and Gulati 2003; Chatterji 2009). Not only might these reputations prove valuable to securing funding, but also they may help to convince skeptical potential employees to join fledgling firms.

[6] Gompers et al. (2005) reported similar results analyzing spinoffs from a sample of public firms in the United States.

In addition to their reputations, spinoff entrepreneurs may also benefit from their direct connections to others in the industry. Workplaces provide settings in which individuals meet and interact with one another. Coworkers quite commonly become friends. Feld (1981), for example, reported that workplaces accounted for a larger proportion of friendships in America than any source other than family.

Friends and colleagues tend to have more favorable beliefs about one another than those without such personal connections. Obviously, selection means that these connections most commonly form among those who hold each other in higher regard. But psychological biases also reinforce this tendency. Mere contact generates positive affect and therefore positive beliefs about others (Sorenson and Waguespack 2006). And confirmation biases mean that friends often disregard information that should lead them to believe otherwise (Wason 1968). These favorable perceptions, therefore, help to assuage potential employees' concerns about the prospects of joining friends' companies. Not surprisingly then, family, friends and former colleagues account for a large proportion of the early employees of entrepreneurial ventures—Ruef (2010), for example, reports that they represented 95% of the members of founding teams in a representative sample of startups in the United States.

Of course, the hiring of family, friends and former colleagues in general has somewhat ambiguous implications for firm performance. On the positive side, it allows entrepreneurs to avoid adverse selection in the labor market (Montgomery 1991). They need not rely simply on those looking for a job. Hiring those they know may also engender trust within the organization and facilitate the establishment of organizational routines (Phillips 2002; Timmermans 2010, 2012). Timmermans (2012), for example, found that startups staffed by employees with more prior experience with one another had significantly higher survival rates than those comprised of strangers. But on the negative side, entrepreneurs' favorable

opinions of these individuals may lead them to hire or promote family, friends and former colleagues ahead of others more qualified.

Spinoff entrepreneurs nevertheless have an added advantage in hiring their former colleagues. Namely, these individuals have experience in the industry and therefore can bring valuable industry-specific human capital to the venture. Prior experience in the industry therefore gives these individuals preferential access to the pool of employees with the highest expected productivity (Sorenson and Audia 2000).

Table 2 explores whether spinoff and non-spinoff entrepreneurs differed in their access to financial resources and in whom they hired. The upper panel, once again, reports data from the survey. Spinoff entrepreneurs did not differ markedly in their access to financial capital, either from family and friends ($p = .535$) or from venture capitalists ($p = .796$). They did, however, report substantial differences in their recruiting patterns: Spinoff entrepreneurs relied less on family to staff their ventures but more on former colleagues.

The lower panel, reporting registry data, tells a similar story. Spinoff entrepreneurs did not have access to greater personal financial resources, either in terms of their own wealth ($p = .581$) or that of their parents ($p = .905$); these measures capture the total net worth, respectively, of entrepreneurs' and entrepreneurs' parents households in Danish kroner. Nor did they differ in terms of their average tenure in the region – the number of years during which the individual resided in the same township as their startup – a measure of regional embeddedness previously found to benefit firm performance (Dahl and Sorenson 2012).

But they did recruit different early employees. The next four variables in the table characterize the employees hired by entrepreneurs in their first year of operations. *Employee labor market experience* counts the number of years of prior experience the employees had, on average, in any industry; *employee 4-digit industry experience* tallies the number of those

Table 2: Bivariate associations for measures of resources

	Mean (Spinoff)	Mean (Other)	Mann-Whitney p-value	Ordered logit	N (of 1,361)
Did you receive a loan or investment from family, friends or other acquaintances?	1.14	1.16	0.535	-0.876 (0.032)**	1,056
Did you receive financing from venture capitalists?	1.02	1.02	0.796	-0.076 (0.085)	1,017
How many of the initial employees were...					
... close family?	1.20	1.29	0.030*	-0.069 (0.025)**	595
... other family?	1.03	1.06	0.096†	-0.143 (0.081)†	578
... former colleagues?	1.41	1.23	0.000**	0.025 (0.020)	586
... other friends or acquaintances?	1.18	1.17	0.975	-0.071 (0.033)*	584

	Mean (Spinoff)	Mean (Other)	T-test Pr-value	Poisson	N (of 1,361)
Household wealth[1]	206,238	234,851	0.581	7,338.2 (5,642.7)	1,361
Parent wealth[1]	620,084	640,078	0.905	-436.8 (18,150)	1,361
Region tenure (years)	4.86	4.52	0.337	0.091 (0.013)**	1,361
Employee labor market experience (years)	3.70	2.55	0.001**	0.206 (0.015)**	1,361
Employee 4-digit industry experience (years)	1.42	0.22	0.000**	0.873 (0.031)**	1,361
Employee region tenure (years)	1.98	1.27	0.001**	0.219 (0.021)**	1,361
Common experience (years)	0.47	0.30	0.052†	0.294 (0.042)**	1,361

years of experience in which the employees had been employed by firms classified in the same four-digit industry as the startup; *employee region tenure* measures the average number of years that employees had lived in the same township as the startup; and *common experience* captures the average number of years of experience that each employee had working with the founder prior to joining the startup. The employees recruited by spinoff entrepreneurs had more overall work experience, more experience in the same four-digit industry as the venture (nearly seven times as much!), more common experience as a coworker with the entrepreneur and more experience living in the region. The employees that spinoff entrepreneurs hired therefore seem higher quality than those hired by non-spinoff entrepreneurs.

Motivation

Spin-off entrepreneurs may also have different reasons for becoming an entrepreneur from those starting businesses in industries that they do not know. This possibility has been a central theme in much of the descriptive and theoretical research on spinoffs. In particular, several have sought to answer the question: Why do employees spin out on their own rather than remaining with their former employers? Two motives have mainly been suggested: (i) disagreements, and (ii) expropriation.

The idea of disagreements has a long history. Garvin (1983), in his early article describing spinoffs, suggested anecdotally that many spinoff entrepreneurs appeared to have had disagreements with the management of their former employers about the future direction of their industries or of the products being developed by their employers. They therefore left to pursue the products and strategies that their former employers rejected. Several papers have developed this idea more rigorously in the context of formal models where these disagreements emerge either because incumbent firms have different incentives for pursuing projects

(e.g., Cassiman and Ueda 2006) or because their managers have less accurate perceptions of the value of novel ideas than would-be entrepreneurs (e.g., Klepper and Sleeper 2005; Klepper and Thompson 2010). These models suggest that spinoff entrepreneurs should pursue more innovative and more profitable ideas than non-spinoff entrepreneurs.

Other models suggest that entrepreneurs leave their former employers to profit from the human and intellectual capital that they gained from their tenure in these firms. Anton and Yao (1995), for example, developed a model in which employees who discover potentially profitable ideas may exit the firm to pursue them on their own. Since their employers do not have enforceable property rights over the inventions, these employees stand to gain more financially from founding their own firms. From these models, one might expect money to motivate spinoff entrepreneurs more than non-spinoff entrepreneurs.

The choice problem in these literatures, however, has been: Why do employees leave their employers? It has essentially been assumed that if they do leave their employers that they will nevertheless remain in the same industry. But clearly many entrepreneurs also start businesses in other industries. Given that these entrepreneurs, too, have presumably gained valuable industry-specific expertise, this decision to shift to another industry seems a bit of a puzzle. We nevertheless see at least two possible factors that might account for these decisions. First, they may have relatively low expected returns to staying in their industries. Non-spinoff entrepreneurs may have discovered through experience that they do not have the abilities or attributes required to succeed in an industry. Or, the industry as a whole may have poor prospects. The systematic removal of poor performers from the population may therefore account for the superior performance of spinoff entrepreneurs. Studies of firm-level diversification, for example, similarly suggest that adverse selection may account for the diversification discount—firms enter new markets because their home markets offer limited

prospects for future growth (Ushijima 2002; Villalonga 2005).

Second, non-spinoff entrepreneurs may have decided for some (non-pecuniary) reason that they did not like their jobs. Job satisfaction depends on a bundle of extrinsic and intrinsic rewards. Individuals differ in the extent to which they value these rewards (Kalleberg 1977). Some care about money; others may prefer a job with flexible hours, so that they can spend time with family and friends or pursuing their hobbies; still others may want a job that they find intellectually stimulating or emotionally fulfilling. Non-spinoff entrepreneurs may have discovered that something about the nature of their former job did not fit well with their preferences and therefore have decided to pursue a different career in a different industry, more in line with their interests. Those choices moreover may lead them to start businesses with less promising financial prospects (because those businesses offer compensating rewards on other dimensions).

In assessing motivations, the survey proves critical. Though the Danish registry data can provide insight into the prior employment experience and the resource mobilization of all entrepreneurs, assessing their motivations requires information on their attitudes and motivations. Table 3 reports the responses of spinoff and non-spinoff entrepreneurs to a variety of questions meant to assess their reasons for starting their ventures and their interest in various forms of extrinsic and intrinsic rewards.

The first nine questions asked entrepreneurs to choose either "very important," "important," or "not important" as a response. Beginning with the first question, spinoff entrepreneurs and non-spinoff entrepreneurs displayed almost no difference in the extent to which they reported disagreements with management as a reason for starting their businesses ($p = .474$); most, moreover, considered it unimportant to their decision to found a firm. Spinoff and non-spinoff entrepreneurs also did not appear to differ in the extent

Table 3: Bivariate associations for measures of motivation

	Mean (Spinoff)	Mean (Other)	Mann-Whitney p-value	Ordered logit	N (of 1,361)
How important were disagreements with colleagues or management for your decision to start a business?	1.37	1.34	0.474	0.040 (0.017)*	855
How important is it that your job provides a high income?	2.04	2.01	0.484	0.002 (0.013)	1,323
How important was unemployment or a resignation to your decision to start a business?	1.40	1.61	0.000**	-0.025 (0.020)	751
How important is it that your job fits your skills and abilities?	2.28	2.36	0.040*	-0.027 (0.013)*	1,317
How important is it that your job strengthens your skills and abilities?	2.44	2.41	0.418	-0.000 (0.012)	1,338
How important is it that you find your work interesting?	2.70	2.72	0.496	-0.032 (0.013)	1,345
How important is it that your work involves a variety of tasks?	2.53	2.49	0.339	0.014 (0.013)	1,338
How important is it that your job allows for vacation and leisure time?	1.71	1.78	0.047*	-0.024 (0.012)†	1,331
How important is it that your job has flexible hours?	1.89	2.00	0.006**	-0.025 (0.012)*	1,314
Within the last five years, have you been unable to participate in family activities due to your job?	2.62	2.43	0.001**	0.017 (0.012)	1,321
Within the last five years, have you been unable to contribute to household chores due to your job?	3.07	2.93	0.006**	0.015 (0.012)	1,322
Within the last five years, has your job required you to work during vacation or holidays?	3.20	3.02	0.001**	0.012 (0.012)	1,323

to which they cited the potential for material rewards as a motivation ($p = .905$), though here both groups considered it important, on average. Those responses therefore raise some questions as to the extent to which the existing formal models of spinoff entrepreneurship capture the actual dynamics of entrepreneurial decisions.

There appears to be more evidence that spinoff and non-spinoff entrepreneurs differ on other motivational dimensions. For example, the responses to two different questions suggest that non-spinoff entrepreneurs may have actively chosen not to stay in their industries, either due to the attractiveness of those industries or due to their poor fit with them. Non-spinoff entrepreneurs reported that a spell of unemployment more commonly influenced their decision to become entrepreneurs and also indicated that they placed greater importance on having a job that fit with their skills and abilities (despite changing industries).

With respect to the importance of the non-pecuniary characteristics of their jobs, the two groups did not seem to differ in terms of the importance of self-fulfillment. Both considered it critical that they find their work interesting and that they have varied tasks.

But the two groups did differ substantially in the extent to which they cared about work intruding in other domains of their lives. Non-spinoff entrepreneurs placed greater importance on having more flexible hours and on having jobs that would accommodate leisure and vacation time. Their self-reports of the extent to which their entrepreneurial ventures infringed on their personal lives revealed consistent patterns. On the final three questions, respondents had to indicate "regularly," "occasionally," "rarely" or "never" as an answer to each question. Spinoff entrepreneurs reported that their jobs more frequently led them to miss out on family activities and to neglect household duties and to work during holidays and vacation. Spinoff entrepreneurs therefore appear to work in less flexible jobs and/or to work harder to ensure the success of their ventures.

Distinguishing characteristics

Though the preceding section discussed factors that appear to distinguish spinoff and non-spinoff entrepreneurs, it did so one variable at a time. Many of these factors nevertheless probably correlate with one another or depend on some common antecedent. To isolate those factors most important to differentiating spinoff entrepreneurs from other founders, we moved to a multivariate analysis.

Table 4 introduces the various variables above into a logit model of whether or not the entrepreneur entered an industry in which s/he had prior experience (i.e. whether the venture qualified as a spinoff). We introduced these variables in three groups based on the three classes of mechanisms discussed above. Because variables that did not differ significantly in their distributions across founder types should not predict the likelihood of being a spinoff, we only included those factors that had either a significant difference in their means across the groups or a significant estimated relationship with industry experience in the ordered logit or Poisson.[7] In the final column, Model 4, we included only factors that had a significant coefficient in one of the first three models.

In the multivariate analysis, a number of factors with significant bivariate associations dropped out as being useful predictors of entrepreneur type. Several nevertheless remain: Among the measures of knowledge, spinoff entrepreneurs had more related industry experience but less managerial experience. They also came from smaller, younger and more profitable firms. With respect to access to resources, all of the measures of financial resources became insignificant, controlling for other factors. Spinoff entrepreneurs, however,

[7]To ensure that the lack of a bivariate association did not depend on some suppressor relationship with a third variable, we also ran a version of Table 4 with all of the variables. None of the variables with insignificant bivariate associations with founder type had a significant coefficient at the .05 level in the multivariate analysis.

Table 4: Estimates of likelihood of being a spin-off

	(1)	(2)	(3)	(4)
Labor market experience (years)	0.003			
	(0.007)			
Related industry experience, 2-digit (years)	0.034*			0.037**
	(0.014)			(0.014)
Top management experience (years)	-0.071*			-0.055†
	(0.033)			(0.032)
Parent firm age	-0.011**			-0.011**
	(0.004)			(0.004)
Parent firm size (5 yr avg)	-0.000**			-0.000*
	(0.000)			(0.000)
Parent firm return on assets (5 yr avg)	1.586**			1.327**
	(0.348)			(0.357)
Did you receive a loan or investment from family, friends or other acquaintances?		-0.061		
		(0.153)		
How many of the initial employees were close family?		-0.486*		-0.341
		(0.214)		(0.214)
How many of the initial employees were former colleagues?		0.604**		0.636**
		(0.162)		(0.166)
How many of the initial employees were other friends and acquaintances?		0.147		
		(0.213)		
Region tenure (years)		0.001		
		(0.010)		
Employee labor market experience (years)		-0.045**		-0.042**
		(0.016)		(0.014)
Employee 4-digit industry experience (years)		0.453**		0.438**
		(0.059)		(0.061)
Employee region tenure (years)		0.010		
		(0.025)		
Common experience (years)		0.019		
		(0.052)		
How important were disagreements with colleagues or management for your decision to start a business?			0.124	
			(0.115)	
How important was unemployment or a resignation to your decision to start a business?			-0.432**	-0.254*
			(0.117)	(0.119)
How important is it that your job fits your skills and abilities?			-0.212*	-0.237*
			(0.098)	(0.104)
How important is it that your job allows for vacation and leisure time?			-0.011	
			(0.095)	
How important is it that your job has flexible hours?			-0.142	
			(0.094)	
Within the last five years, have you been unable to participate in family activities due to your job?			0.116	
			(0.073)	
Within the last five years, have you been unable to contribute to household chores due to your job?			0.066	
			(0.083)	
Within the last five years, has your job required you to work during vacation or holidays?			0.126†	0.153*
			(0.075)	(0.070)
Constant	-0.593**	-1.093**	-0.266	-0.622
	(0.119)	(0.412)	(0.454)	(0.487)
Pseudo R^2	0.04	0.08	0.02	0.11
Log-likelihood	-842	-807	-853	-775
Chi-squared	63.47	133.35	40.95	197.81
Observations	1,361	1,361	1,361	1,361

still appeared to recruit more heavily from their former colleagues, therefore also signing early employees with more experience in the industry (though with less experience in other industries). Interestingly, these recruiting differences had the strongest ability to distinguish spinoff and non-spinoff entrepreneurs.

Three motivational factors also continued to distinguish spinoff entrepreneurs from others: A spell of unemployment less frequently influenced spinoff entrepreneurs decisions to become entrepreneurs; spinoff entrepreneurs also placed *less* importance on having a job that fit their abilities and attributes; and spinoff entrepreneurs more frequently reported working on holidays and vacations.

Performance

Even if spinoff and non-spinoff entrepreneurs differ on some dimensions, those differences do not necessarily help to account for the performance advantage enjoyed by spinoffs unless those factors also contribute in some way to firm performance. We therefore also explicitly investigated the extent to which these various factors accounted for the spinoff advantage.

We began exploring the performance implications by analyzing the functional form of the relationship between survival and years of industry experience using a flexible, non-parametric specification. In particular, we regressed the exit rate for startups on a vector of indicator variables for each and every possible number of years of prior experience in the four-digit industry. By definition, the founders in all non-spinoff firms have zero years of prior experience. Figure 2 displays the estimated coefficient for each indicator, as well as 95% confidence intervals for those estimates.

This analysis has two purposes. First, it gives us some insight into whether selection or maturation processes contribute more strongly to the spinoff advantage. If selection

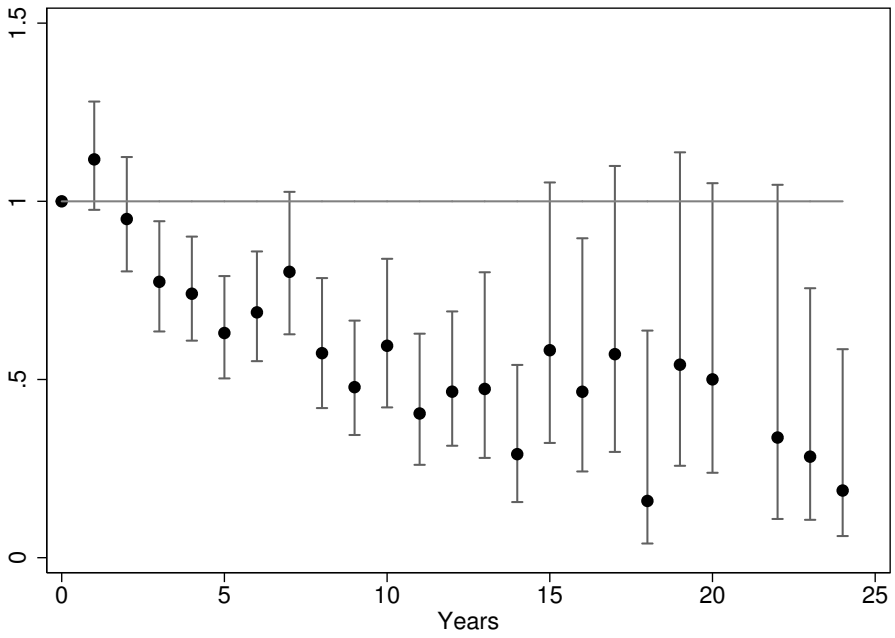

Figure 2: Multiplier rate of exit by years of industry experience

processes dominate, then one would expect the difference to emerge with the first few years of industry experience and then to remain relatively constant. If, on the other hand, maturation processes – such as the accrual of human or social capital – prove paramount then one would expect the performance differential between spinoff and non-spinoff entrepreneurs to grow over time. From the figure, it appears that the advantage of spinoffs relative to non-spinoffs rises with the industry experience of their founders, suggesting that some sort of maturation process dominates (if anything selection actually seems somewhat negative, with spinoffs with only one year of industry experience doing worse than non-spinoffs).

The second purpose is to garner some sense of the appropriate functional form for including industry experience with other measures in the multivariate analysis of firm performance. The individual coefficient estimates increase in magnitude but as a decreasing rate. The individual coefficients displayed do not differ significantly from the predictions produced by

the logged number of years (plus one to avoid logging zero). We therefore simplify the specification to logged years of industry experience in the next set of regressions.

Table 5 then examines firm performance in a multivariate context. The first column includes only the logged years of prior industry experience of the founder. Prior experience has a significant and large effect on exit rates; a doubling in industry experience decreases the failure rates of firms by 24%. Since the average spinoff entrepreneur has more than six years of experience in the industry, he enjoys roughly 38% ($= 1 - e^{-.235 \times \ln(6.47+1)}$) lower failure rates than the average non-spinoff entrepreneur.

Table 5: Estimates of startup exit rates

	(5)	(6)	(7)	(8)	(9)
Industry experience, 4-digit (years, logged)	-0.235**	-0.204**	-0.187**	-0.199**	-0.150**
	(0.051)	(0.053)	(0.053)	(0.051)	(0.052)
Related industry experience, 2-digit (years, logged)		-0.127*			-0.107*
		(0.051)			(0.052)
Top management experience (years, logged)		-0.077			
		(0.078)			
Parent firm age (logged)		-0.144**			-0.122**
		(0.040)			(0.040)
Parent firm size (5 yr avg, logged)		0.032†			0.023
		(0.019)			(0.019)
Parent firm return on assets (5 yr avg, logged)		0.049†			0.036
		(0.029)			(0.029)
How many of the initial employees were close family?			0.189		
			(0.144)		
How many of the initial employees were former colleagues?			0.033		
			(0.128)		
Employees labor market experience (years, logged)			-0.258**		-0.236**
			(0.058)		(0.049)
Employees 4-digit industry experience (years, logged)			-0.077		
			(0.127)		
How important was unemployment or a resignation to your decision to start a business?				0.230**	0.165*
				(0.074)	(0.074)
How important is it that your work fits your skills and abilities?				-0.020	
				(0.072)	
Within the last five years, has your job required you to work during vacation or holidays?				-0.288**	-0.272**
				(0.044)	(0.044)
Constant	-8.353**	-8.032**	-8.519**	-7.836**	-7.463**
	(0.131)	(0.150)	(0.278)	(0.268)	(0.227)
Age dummies	Yes	Yes	Yes	Yes	Yes
Log-likelihood	-1,396	-1,382	-1,376	-1,371	-1,346
Chi-squared	61.19	90.57	100.65	111.18	161.93
Observations	4,696	4,696	4,696	4,696	4,696

Models 6 through 9 then enter those factors that distinguished spinoff entrepreneurs from non-spinoff founders. Several of these factors appear unrelated to startup performance. Somewhat surprisingly, though the coefficient on prior managerial experience has a negative sign, suggesting that it might increase survival rates, the standard errors around this estimate do not allow us to reject the possibility that managerial experience had no effect on survival. Parent firm size and profitability also have weak relationships, at best, to the performance of their progeny. Most of the differences in recruiting patterns also appear to have little effect on startup performance.

In total, only five of the eleven variables distinguishing spinoff and non-spinoff entrepreneurs correlated significantly with startup performance. Founder experience in related industries reduced the failure rates of their ventures. Since spinoff entrepreneurs more commonly had experience in related industries as well, this effect accounted for a portion of the spinoff advantage. Entrepreneurs who had previously worked in *older* firms also had lower failure rates. That's somewhat surprising because previous research had found entrepreneurs coming from smaller (and presumably younger) firms to have lower failure rates (Sørensen and Phillips 2011). It also means that estimates of the performance advantages associated with spinoffs may sometimes underestimate those benefits because spinoff entrepreneurs, on average, come from younger organizations (a disadvantage).

Having employees with more work experience overall also had a positive relationship with firm performance. But again, surprisingly, it did not seem to matter in what industry employees had gained their experience. Experience in the same industry had no more value than experience in other industries.

Finally, entrepreneurs motives for starting their own businesses also correlated with firm performance. Those who became entrepreneurs because they had experienced a spell of un-

employment had ventures with higher failure rates. Lesser abilities may account for both their earlier loss of a job and the later failure of their firms. Since non-spinoff entrepreneurs more frequently experienced these spells of unemployment prior to starting their firms, selection on abilities therefore may account for a portion of the spinoff advantage.

Entrepreneurs willing to work on holidays and vacations also had lower failure rates. That's not surprising. One would generally expect a positive relationship between effort and performance. But again, since spinoff entrepreneurs reported forgoing these leisure days more frequently, this too may account for part of the positive performance associated with prior experience in the industry.

Together, these factors appeared to account for roughly one-third of the spinoff advantage, as the coefficient for industry experience declines substantially after controlling for these differences between spinoff and non-spinoff entrepreneurs. But founder industry experience continued to have a direct, positive relationship on the performance of their firms. Why? One possibility is that the factors that we explore do completely mediate the relationship between industry experience and performance but that measurement error prevents us from adequately controlling for these factors (Judd and Kenny 1981). Another is that we have omitted some important mechanism captured by the residual differential.

A third (likely) possibility is that industry-specific organizational and technical knowledge accounts for much of this effect. Though our data have the advantage of allowing us to consider many mechanisms not observed in early research on spinoffs, our cross-sectional design has a disadvantage with respect to assessing certain types of industry-specific knowledge, such as technical knowledge. Since measures of this knowledge are often quite specific to the industry, such as areal density in disk drives (Agarwal et al. 2004), they do not lend themselves to studies that span whole sectors of the economy (for an exception, however,

see Feldman et al. 2012). Given our inability to measure this knowledge transfer directly, we consider it quite likely that the transfer of this industry-specific knowledge might account for a good share of the residual value of industry experience in our estimates.

Discussion

Drawing on unique data from Denmark, we found that spinoff entrepreneurs differed from non-spinoff entrepreneurs in numerous ways. Spinoff entrepreneurs had less managerial experience but more experience both in the industry they entered and in related ones. Spinoff entrepreneurs had previously been employed in smaller, younger and more profitable firms. When starting their businesses, spinoff entrepreneurs recruited as early employees fewer from their family and more who had previously been co-workers. Spinoff entrepreneurs also appeared to work harder and to care less about having a job with flexible hours. They also had been less likely to enter entrepreneurship from a spell of unemployment.

Only a few of these differences, however, appeared to contribute to the better performance of spinoffs. Notably, the recruitment of more experienced employees, having not had a prior spell of unemployment and exerting greater effort each accounted for a portion of the performance benefits associated with prior experience in the industry. But, even after accounting for these differences, spinoffs still outperformed non-spinoffs.

Though our results could not isolate one particular mechanism that accounted for the outperformance of spinoffs, they do usefully inform many of the hypotheses that have been forwarded for this effect. For example, one prominent claim has been that spinoffs originate from employees who have had disputes with management about the appropriate strategic direction of the companies for which they work. When they cannot convince management to adopt their visions, they pursue them on their own (e.g., Garvin 1983; Klepper 2007;

Thompson and Chen 2011; Klepper and Thompson 2010). Though anecdotal accounts suggest that this scenario does occur occasionally, on average, entrepreneurs rarely reported disagreements as being an important factor in their decisions to start their firms, and spinoff entrepreneurs appeared no more likely than non-spinoff entrepreneurs to have reported disagreements as a motive.

Another claim about spinoffs has appeared in the literature on agglomeration, where spinoffs have been seen as an important source of within-region spillovers as employees leave the largest and most profitable established firms to start their own companies (Klepper 2007; Greenstone et al. 2010). Klepper (2007), for example, presents evidence that the entrepreneurs in Detroit in the automobile industry had previously been employed at the largest and most successful incumbents. As the story goes, these spinoff entrepreneurs had access to the recipe for the "special sauce" from the most able firms in the industry and used it to their advantage.

We nevertheless found little to support this idea. Human capital clearly matters. Survival rates increased with both industry experience and related industry experience. But the value of this industry experience did not seem to depend much on its source. Spinoffs may still contribute importantly to agglomeration, as in Detroit. But the reason probably depends more on the simple fact that having previously been employed in the industry means that these entrepreneurs live in close proximity to incumbents and therefore they generally locate their companies near to them (Sorenson and Audia 2000; Dahl and Sorenson 2009).

Our results also suggest at least two interesting avenues for future research, both on spinoffs and on entrepreneurship more generally. First, we found that spinoff entrepreneurs differed from non-spinoff entrepreneurs in who they recruited. At least some of these differences appeared to contribute to the performance advantages of spinoff entrepreneurs. Does

this recruiting effect then represent a return on industry-specific social capital, knowledge of who one would want to hire and the ability to convince them to join the venture? Or do spinoff entrepreneurs simply have better ideas or other attributes that allow them to attract more able employees? More broadly, one would want to know much more about which employee attributes prove most valuable to startups (and whether the same employees thrive at both startups and established firms). Though both practitioners and academics would generally agree that the success of startups depends in large part on the quality of its early employees, relatively little systematic research has been done of this issue (for important exceptions, see Ruef et al. 2003; Ruef 2010; Timmermans 2010, 2012).

Second, we found substantial evidence of selection not just in who becomes an entrepreneur but also in which industries they choose to entry. Those entering industries in which they have prior experience appear likely to have interests and abilities that fit better with the demands of those industries. They also seem willing to work harder. These differences in who becomes a spinoff entrepreneur, moreover, appear to matter to startup performance. With few exceptions (e.g., Nanda and Sørensen 2010; Dahl and Sorenson 2012; Kulchina 2012), however, studies of entrepreneurs have paid relatively little attention to the extent to which who becomes an entrepreneur, the industries and locations they choose and how they structure their organizations may depend on differences in the people and the social context of those involved.

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Appendix

Our study draws on a dataset created by connecting a representative cross-sectional survey of 1,446 first-time entrepreneurs in Denmark to longitudinal Danish census data—in particular, the matched employee-employer database known by its Danish acronym, IDA. The survey provides some insight into the motivations and startup activities of entrepreneurs while the census data allow us to track entrepreneurs (and their employees) for 23 years prior to entering into entrepreneurship and for four years following the establishment of their firms.

The survey comprised questions relevant to entrepreneurship from a number of well-established instruments, such as the European Value Study, the General Enterprising Tendency Test (GET2), the General Social Survey, and the survey on Factors of Business Success (FOBS). It also included a number of novel additional questions on the extent to which entrepreneurs relied on social relationships for support in their startups. Dahl et al. (2009) provides a complete description of the sampling, the survey design and question and the responses received (Appendix G includes a copy of the complete survey instrument).

Statistics Denmark mailed out the survey in the spring of 2008, collected and coded the responses, and linked the survey data to the IDA. It derived the sample for the questionnaire on the basis of information from IDA. The sampling frame included all people living in Denmark of working age (15 to 66 in 2004). The primary group for the survey, entrepreneurs, comprised only those who had started a business in 2004 (N=6,799). Restricting this set to those who had never previously founded a firm reduced the number eligible for the survey to 4,586. Statistics Denmark sent surveys to this entire population of first-time entrepreneurs and received 1,446 completed questionnaires a 31.5% response rate). Statistics Denmark also sent surveys to a secondary group, a matched random sample of non-entrepreneurs. Note, however, that our analyses do not use any of the respondents from this comparison set.

Because the original sample had been selected from the IDA data, Statistics Denmark had extensive information on those who did not respond to the survey as well as those who did. Nielsen (2011) analyzed and documented these differences in detail. His comparisons revealed that female, older, married, native Danish, higher earning, more wealthy and more educated individuals responded at significantly higher rates. However, these groups differed little in terms of absolute differences in response rates. The large sample size simply meant that he had substantial statistical power for precisely identifying even small differences.

Figure 3 depicts the hazard rates for the firms started by the spinoff and non-spinoff survey respondents. Though the pattern here appears consistent with that observed in the population as a whole (see Figure 1), it differs in two ways from the entire 1995-2004 population of entrepreneurs. First, the sample of respondents, both the spinoffs and the non-spinoffs, had higher survival rates, on average. Second, in the sample of respondents, spinoff and non-spinoff entrepreneur differed somewhat less in their performance than in the population as a whole. Given these facts, our findings probably understate the differences between spinoff and non-spinoff entrepreneurs.

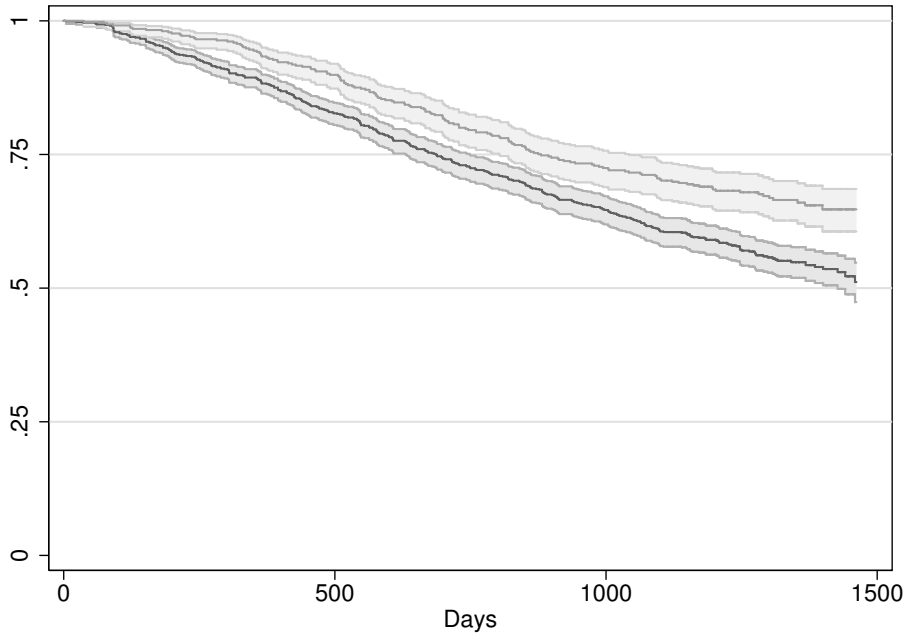

Figure 3: Kaplan-Meier survival plot for spinoffs (light) and non-spinoffs (dark) among survey respondents.